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ABSTRACT

"Exploring Careers" is a career education resource program, published in fifteen separate booklets, for junior high school-age students. It provides information about the world of work and offers its readers a way of learning about themselves and relating that information to career choices. The publications aim to build career awareness by means of occupational narratives, evaluative questions, activities, and career games grouped in fourteen occupational clusters. This tenth of the series, "Mechanics and Repairers," presents an overview of jobs in mechanical and repairing occupations, such as watch repairers, business machine repairers, and telephone installers. Narrative accounts focus on an auto mechanic, a computer service technician, and a jeweler, describing what they do and how they prepared for their careers. Exploring sections relate skills needed for these occupations to students' personal characteristics, and learning activities such as making metric conversions and building a small computer from a kit are suggested. A Job Facts section lists nature and places of work, training and qualifications, and other information for twenty-eight mechanical and repairing occupations, grouped into occupational clusters of telephone crafts, and other repairing occupations. ("Exploring Careers" is also available as a single volume of fifteen chapters.) (KC)

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Exploring Careers

Mechanics and Repairers

U.S. Department of Labor
Ray Marshall, Secretary

Bureau of Labor Statistics
Janet L. Norwood, Commissioner
1979

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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Exploring Careers is available either as a single volume of 15 chapters or as separate chapters, as follows:

The World of Work and You
Industrial Production Occupations
Office Occupations
Service Occupations
Education Occupations
Sales Occupations
Construction Occupations
Transportation Occupations
Scientific and Technical Occupations
Mechanics and Repairers
Health Occupations
Social Scientists
Social Service Occupations
Performing Arts, Design, and Communications Occupations
Agriculture, Forestry, and Fishery Occupations

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Preface

Exploring Careers is a career education resource for youngsters of junior high school age. It provides the kind of information about the world of work that young people need to prepare for a well-informed career choice. At the same time, it offers readers a way of learning more about themselves. The publication aims to build career awareness by means of occupational narratives, evaluative questions, activities, and career games presented in 14 occupational clusters. *Exploring Careers* emphasizes what people do on the job and how they feel about it and stresses the importance of "knowing yourself" when considering a career. It is designed for use in middle school/junior high classrooms, career resource centers, and youth programs run by community, religious, and business organizations.

This is 1 of 15 chapters. A list of all the chapter titles appears inside the front cover.

Exploring Careers was prepared in the Bureau's Division of Occupational Outlook under the supervision of Russell B. Flanders and Neal H. Rosenthal. Max L. Carey provided general direction. Anne Kahl supervised the planning and preparation of the publication. Members of the Division's staff who contributed sections were Lisa S. Dillich, David B. Herst, H. Philip Howard, Chester Curtis Levine, Thomas Nardone, Debra E. Rothstein, and Kathy Wilson. Gloria D. Blue, Brenda Marshall, and Beverly A. Williams assisted.

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Although they are based on interviews with actual workers, the occupational narratives are largely fictitious.

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Exploring Careers

Mechanics and Repairers

Mechanic jobs involve considerable physical activity, but most require only moderate strength.

It was Superbowl Sunday. Ed turned on the television set and sat down to watch the game. Even before he could open the bag of potato chips, the picture began to roll ... and then it was gone. Not wanting to miss a minute of the game, Ed ran to the phone to call Kathy. He was sure he could watch it at her house. But when he picked up the phone, there was no dial tone. Annoyed, Ed decided to drive to Kathy's anyway. The car started with a roar. Then there was a loud crack, the roar turned into a weak wheeze, and the engine sputtered into silence. Very upset, Ed jumped out of the car and slammed the door. Too late, he realized that he had locked it. Inside the locked car, dangling from the ignition switch, was the key ring with his house key. As the first drops of rain began to fall, Ed looked into the sky and shouted, "Help!" This certainly wasn't his day. He hoped his team was having better luck than he was.

The help that Ed needed could have come from four people: A television service technician, a telephone repairer, an automobile mechanic, and a locksmith. These skilled workers could have repaired the machines that caused Ed's trouble. Like Ed, we all use machines and, at times, need mechanics to repair and service them. Many businesses and industries rely on these workers every day.

Have you ever thought about working as a mechanic? There are many jobs to choose from—so many that just listing all of them would take several pages. After all, every machine creates work for some type of mechanic. Just think about all the machines you see in a single day. Sooner or later, all of them need to be serviced or repaired.

Body repairers take pride in their ability to make damaged cars look like new.

What Do Mechanics Do?

What comes to mind when you picture a mechanic at work? You may see the feet of an automobile mechanic sticking out from underneath a car. Perhaps you picture an appliance repairer poking around the back of your refrigerator. Maybe you imagine a business machine mechanic repairing a typewriter in the office of your school. Or see a jeweler replacing the diamond in a gold ring.

So many different images come to mind, you might wonder what all these workers have in common. All of them use their minds and hands to fix things—air conditioners, farm equipment, motorcycles, pianos, or some other machine. Mechanics use their minds to find the cause of mechanical problems and their hands to correct the problems. Let's examine their work more closely.

A mechanic needs patience to do the job right.

Mechanics and Repairers

Mechanics Solve Mechanical Puzzles

Before mechanics can repair a machine they must find out why it isn't working. Why won't a boat motor start? Why doesn't a soda machine give the correct change? Why are the copies from a photocopier so light? This is just what a doctor has to do before prescribing treatment for someone who is sick. This "diagnostic work" often is very difficult, but many mechanics feel that solving the mechanical puzzle is the most interesting part of the job.

To find out why a machine will not work, mechanics first check the common and obvious causes of trouble. When an electric sign does not light, the mechanic begins by checking the bulb. If that's not the cause of the trouble, the mechanic looks elsewhere.

Mechanics search for clues to the cause of the problem in an orderly way. Their knowledge of how the machine works tells them where to look and what to look for. Mechanics may listen to a motor for a telltale whine. They may test electrical circuits to see if electricity is running through them properly. They may take a machine apart. They do whatever is necessary to check the possible causes of a mechanical problem. Because many machines are complex, mechanics often rely on repair books and technical manuals to guide their search.

Trial and error also plays a role in the search. If adjusting the do-hickey does not make the widget work, maybe the gizmo should be tightened. However, even this is done in an orderly way. Mechanics know what to do if the first repair does not do the trick. Their knowledge shows them how to try, try again.

Finding the cause of a problem in a stereo amplifier is like solving a puzzle.

Mechanics Correct Mechanical Problems

Once mechanics have determined why a machine will not work, they make the necessary repairs. The repair work often involves taking apart a machine and repairing or replacing worn or broken parts. However, it may be possible to fix a machine by simply turning a screw that tightens a rubber belt or scraping the rust off an electric contact. Some machines are harder to repair than others. There's a big difference between repairing a toaster and repairing a diesel engine.

To make repairs, mechanics work with their hands and with tools. They use common hand and power tools such as screwdrivers, pliers, and electric drills. They also use special tools of the trade. Shoe repairers, for example, use skivers—knives that are made especially to split leather.

This motorcycle mechanic finds that time passes quickly when he is absorbed in his work.

Jet engine mechanics help make air travel safe.

Mechanics Prevent Mechanical Problems

Many mechanics spend much of their time keeping machines in good working order. This is called maintenance work. Most machines need regular maintenance work to keep them in top condition. If the engine in a bus is not tuned regularly, it will run poorly and use more fuel. Eventually it will break down. Maintenance work is especially important with machines that must not fail in use. If an airplane engine has a problem, the mechanic had better spot it while the plane is on the ground!

Mechanics Do Other Things

In addition to repair and maintenance work, mechanics do other things. Some install machines—telephones, for example. Some mechanics do paperwork; they may record the amount of time they spend on a job or accept payment from customers. Experienced mechanics may train new workers. Mechanics who have their own repair shops order supplies, hire and supervise other workers, and keep the records for the business.

This auto mechanic is getting a new car ready for a customer.

Mechanics and Repairers

What Makes a Good Mechanic?

What does it take to be a mechanic? If you asked employers or experienced mechanics that question, you'd probably get several answers.

- "You have to be good with your hands."
- "You have to understand machines."
- "You have to know how to use tools."

All these descriptions refer to something often called "mechanical aptitude." People who have mechanical aptitude have a knack for understanding how machines work and for fixing them. It's a knack that is essential for anyone who wants to work as a mechanic.

The ability to solve problems is an important part of mechanical aptitude. Repairers must be able to understand what makes a machine run. What does each part do? How do the parts work together? What can happen to the parts to cause trouble? Mechanics must be able to use this understanding to answer the questions, "What's wrong with this machine?" and "How do I fix it?"

Another important part of mechanical aptitude is the ability to work with your hands and with tools. This may seem easy. After all, many people work with their hands and use the same tools mechanics do. It would be exaggerating to say that mechanics need the hands of a surgeon, but manual skill is important. You may be able to take a watch apart. And you probably can learn to put it back together so that it works. But do you have enough manual dexterity and eye-hand coordination to fix dozens of watches in a single day? You would need those skills to earn a living as a watch repairer. To put it another way, a lot of people play basketball, but only a few are pros.

In addition to mechanical aptitude, there are other characteristics that are helpful to a mechanic.

Ability to work under pressure. Whether mechanics are repairing a pinsetter in a bowling alley or a generator in a factory, they often must work quickly so that customers are not inconvenienced.

Ability to work without supervision. On most repair jobs it is just the mechanic and the machine, one to one. Mechanics set their own schedule and pace, but they have to get the work done, on time and correctly.

Good eye-hand coordination is needed to install telephone wiring.

Telephone line installers must be agile.

Stamina. Some mechanics are very active workers. They may stoop, bend, kneel, and crawl around machines. They may lift, push, and pull machines, tools, and spare parts. They may climb ladders and scaffolds or drive a repair truck many miles during a day.

Patience. Finding and fixing the problem in a machine may take hours or days. If the mechanic rushes through a job, it could cause more trouble later.

Tact and courtesy. Mechanics often have to deal with customers and machine operators who are upset because their machines are not working.

Training for Mechanic and Repair Occupations

Repairing is skilled work. It takes training to learn how a machine runs and how to fix and service it. For most repair occupations there are several ways of getting the training you need. To find out about training requirements in specific mechanic and repair occupations, see the Job Facts at the end of this chapter.

You may be preparing for your career already. Do you read about machines—what they do and how they do it? If so, you are developing a background in basic mechanics that will help you understand more difficult repair books and technical manuals later on. You may have hobbies in which you work with your hands. Perhaps you build models, make jewelry, or draw. Many mechanics get their start by doing repairs around their homes. Through activities such as these you learn to work with your hands and to use tools.

High school is the first step to a career as a mechanic. You may have heard that mechanics do not need a high school education. In some occupations this is true. However, all employers prefer to hire high school graduates. And in high school you will learn a lot that will help you later on. In mathematics classes you work with numbers and solve problems—good practice for solving mechanical problems later on. In science classes you study physics and electricity. These subjects help mechanics understand how machines operate.

Many high schools also have classes in woodworking, metalworking, drafting, electronics, and specific types of repair work such as appliance repair, auto mechanics, and television and radio repair. These classes provide good experience, because you work with the same kinds of machines and tools in class that you would use on the job. Such high school courses may give you the skills you need to land your first job or open the way for further training.

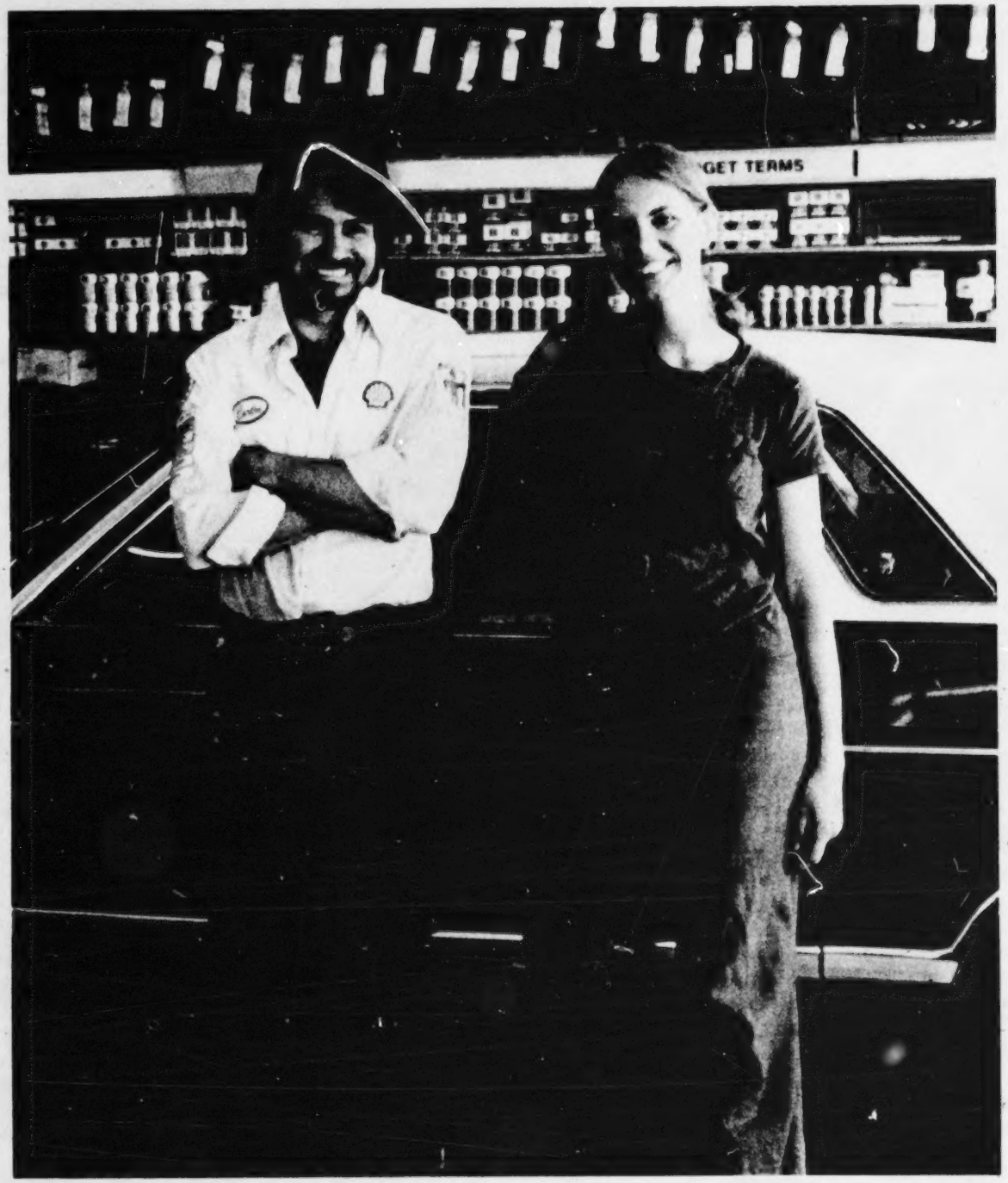
After high school, there are several ways to train for a career as a mechanic. You can attend a vocational school or a community or junior college. These schools offer training in almost every type of repair work. Such training programs sometimes are preferred for mechanics who repair complex machines, such as computers, business equipment, and electronic instruments.

In many mechanical occupations you can start work immediately after high school and train on the job. You learn the trade by observing and helping experienced mechanics. You can train for some occupations through apprenticeship. Apprenticeships combine on-the-job training with classroom instruction in job-related subjects, such as blueprint reading, electrical theory, and safety practices. You may have to belong to a union or already work for a company to be eligible for an apprenticeship.

Another possibility is the military, which employs many mechanics. You can train and get valuable experience for many repair occupations in the Armed Forces.

Once you become a mechanic, it won't take long to learn that your training never ends. Every year machines are improved and made more complex. Hundreds of new machines are introduced. To keep up with these changes mechanics must continue to train throughout their careers. You will have to study new repair books and technical manuals. You may have to attend classes run by companies that make machines or even take classes at a high school or a community or junior college. There always will be something new to learn.

Auto Mechanic



Mechanic Carlos Romo and mechanic trainee Pamela Dobbins.

The sky was slate grey and the rain had slowed to a fine mist. It was surprisingly chilly for a late May morning. A wave of cold damp air greeted Carlos Romo as he stepped out of the tow truck. A tractor trailer roared by. Carlos shivered a moment. "Glad I wore my Army field jacket," he thought.

This was the first repair call of a day that promised to be a long one. Carlos' partner was on vacation. The man who usually drove the truck was sick. The weather was lousy. And it was only 6 o'clock in the morning! Carlos had been fast asleep when the phone had rung ... a driver on Route 29 needed emergency road service.

"What seems to be the matter?" said Carlos to the man who stood gloomily by the side of the road, leaning against a dark green sedan. "Am I glad to see you!" responded the man. Then he explained that his name was Jack Kelly and the trouble had begun when he had pulled off the road to check the windshield wipers. The wipers had been acting "funny". When Mr. Kelly had tried to start the car again, nothing had happened. So he had called Carlos. Carlos' was the only 24-hour towing service listed in the phone book.

Carlos slipped behind the wheel of the green car, then took a good look at the gas gauge and gear selector. No problems there; the car had gas and was in gear. From Mr. Kelly's description, Carlos was almost certain that the battery was dead. But it always paid to check everything. Carlos turned on the ignition. The engine would not turn over. Sure enough, the battery was dead. Now the question was, "Why?"

Carlos found the answer as soon as he opened the hood. The fan belt was broken. Without a fan belt, the car's alternator would not work. All the electrical systems—the lights, the radio, and the windshield wipers—had to use power from the battery. So much of the battery's power had been used already that there wasn't enough left to restart the car.

"Your battery is dead," said Carlos to Mr. Kelly.

"That's what I figured," replied Mr. Kelly. "Well, give me a jump and I can be on my way."

"I'm afraid not. The fan belt is broken. I can jump start the car but the battery would just die again. I'll have to tow you into the shop and replace the belt."

Frustration was written all over Mr. Kelly's face.

"Are you sure there's nothing you can do here to get it to run? I have to be in Philadelphia by tonight."

"Sorry," replied Carlos. "I don't have a belt here and the battery should be recharged, if it can be. It may be totally gone. You might need a new one."

"Well ... okay. Let's go."

Carlos hooked the car to his tow truck and drove to his garage.

The garage was a small rectangular building with bare cinder block walls, a cement floor, and steel frame roof. On the left side in the rear was a hydraulic floor jack. Next to the jack were Carlos' workbench and tool chest. The workbench was littered with greasy rags, the parts of a disassembled carburetor, and some papers. In contrast, the tool chest and its contents were in perfect order and spotless. Carlos could work on a messy bench, but not with messy tools. Besides, the handtools had cost over $1,000 and he wanted to protect that investment. Storage shelves lined the back wall of the garage. The shelves were stocked with spare parts. Carlos did not keep a large supply of parts, just enough to handle common repairs and maintenance jobs.

Next to the shelves was a small room with a shower and some lockers. Tom's work area took up the right side of the garage. Tom was Carlos' partner. As usual, Tom's area was neater than Carlos'. Carlos often wondered how Tom could possibly work that way....

Carlos lowered Mr. Kelly's car from the tow truck and pushed it near his work area. Then he returned to the front of the shop to speak to Mr. Kelly.

"This will take a couple of hours. There's a cafe down the block, if you want breakfast."

"I think I'll just hang around here," said Mr. Kelly.

"Suit yourself. I'll be making some coffee, if you want any."

Carlos could tell that Mr. Kelly's frustration was turning to impatience. Sometimes I wish I were back at the Service Center, he thought. No contact with the customers, just get the cars from the service manager and do the work.

As Carlos made the coffee, he remembered how excited he had been when Tom had first suggested that they start their own business. All they had to begin with was a tow truck and an ad in the yellow pages.

Business had been slow at first, but as time went on they had earned a reputation for honesty and good work. Their customers had begun asking them to service their cars. So Tom and Carlos had rented a service station and garage, hired a part-time truckdriver, and begun doing tune-ups, lube jobs, and minor repairs.

Now they had a small group of regular customers and all the work they could handle. In fact, business was so good that Tom and Carlos were thinking of dropping the towing service. "That might not be a bad idea at all," thought Carlos as he suddenly noticed Mr. Kelly glaring at him from across the garage. Carlos sighed and started to work.

Carlos used a hydrometer to check the battery's cells. The battery was not completely dead, which meant it could be recharged. Carlos disconnected the cables, removed the battery, and placed it in the recharger.

"How much longer?" demanded Mr. Kelly.

Carlos shows Pam how to use an engine tester. "You can learn a lot by helping friends fix cars," advises Carlos.

"About an hour," replied Carlos.

"Well, I guess that will have to do," replied Mr. Kelly.

"What's up, Carlos?" called a voice from the rear of the shop.

Carlos turned and saw a teenage girl walking toward him. It was Pam, his trainee.

"Nothing much, I'll be busy with this job for an hour or so. That station wagon out front needs to be tuned. Points, plugs, condenser, timing, the whole bit. If you have any trouble, just yell. The keys are on my bench somewhere."

"I could spend all morning looking for them in that mess," Pam said in mock horror.

"Very funny. Get to work," answered Carlos with a smile.

Pam went to the locker room to change.

Pam was a senior at Central High. Her auto repair teacher, a friend of Carlos', had asked him to give her a part-time job so that she could get some experience.

Carlos had hesitated at first. He was not sure he wanted to take the time to supervise an inexperienced worker. After all, his income depended on the amount of work he did. But then Carlos remembered how hard it had been to get his first job. He always had liked working on his car, or helping friends and neighbors with theirs. When Carlos had graduated from high school, he had tried to get a job as a mechanic. But there weren't many jobs for people without experience or training. It wasn't until Carlos got out of the Army—where he had taken training in automotive mechanics—that a shop owner was willing to give him a job. Now, with Pam, he had a chance to give someone else a start.

Carlos went to the storage area to get the belt that he would need. He checked a parts supply book to get the number of the belt that fit the car. He also noticed the supply of oil filters was low. When he returned to his bench, he wrote a note to himself to call the parts distributor and order some filters.

By the time Carlos returned to Mr. Kelly's car, Pam was working on the station wagon. Mr. Kelly was pacing back and forth.

It didn't take long to install the new belt. When Carlos had finished, he walked over to Pam.

"How are you doing?" he asked.

"Fine," she replied, looking up from her work. "But this car is a mess. Look at these spark plugs. I didn't

"Being a mechanic has given me the opportunity to have my own business," says Carlos. "I prefer working for myself."

think a car could run with plugs that old. I think this thing needs more than a tune-up. The belts and hoses look worn. The oil is filthy. I bet the transmission fluid should be changed. I'd feel guilty sending it out with just a tune-up."

"Well," said Carlos as he glanced at the engine. "I'll take a look at it later. Then I'll call Mr. Howard and tell him what should be done. He'll probably want the work done. I'd better finish over there before that guy paces a rut in the floor."

Carlos went to the battery recharger; the battery was ready. Carlos replaced it as quickly as he could. All the time Mr. Kelly kept fidgeting.

When Carlos had finished, he tried to start the car. The engine coughed, sputtered, wheezed, and made several noises Carlos had never heard an engine make. But it started.

"It's fixed," shouted Mr. Kelly. "Sounds great."

"He's got to be kidding," thought Carlos. He suspected that something was seriously wrong with the engine.

"The car is running and it should get you to Philly, but the engine sounds like it needs more work," Carlos explained, "I can do it next. . . ."

"So long as it lasts through the trip, I'll be satisfied," interrupted Mr. Kelly. "I'll dump it soon anyway. It's always been a lemon."

"Okay. I'll get your bill," said Carlos as he walked back to his bench.

After Mr. Kelly had paid, he rushed to the car and called, "Thanks a lot, see you. . . ."

"Maybe sooner than you think," thought Carlos.

Mechanics and Repairers

Exploring

Automobile mechanics repair and service cars.

- Are you interested in machines and the way they work?
- Do you like to read about cars, motorcycles, and other motor vehicles?
- Have you ever wondered how cars run?
- Have you ever wondered why cars break down?

Automobile mechanics work with their hands. They use tools and must do their work quickly and skillfully.

- Do you like to work with your hands?
- Do you like to build models or repair things around your home?
- Do you ever help repair bicycles, mini-bikes, lawnmowers, or cars?
- Do you enjoy fixing things? Does it give you a sense of accomplishment?
- Are you handy with tools?
- Is it easy for you to learn how to use a tool you've never used before?

Automobile mechanics sometimes must search for the cause of car trouble. They have to solve mechanical puzzles.

- Do you like to work on written mathematics problems?
- Do you like to do three-dimensional puzzles?
- Do you try to solve problems in an orderly and logical way?
- Are you persistent? Will you work on a problem until you solve it?

Automobile mechanics use technical books such as repair manuals.

- How well do you understand technical reading? Your science and mathematics textbooks are examples. Do you enjoy this sort of reading?
- Can you use charts, graphs, and diagrams?
- Can you look at a drawing and picture the three-dimensional object in your mind?

Automobile mechanics usually work alone. They must have confidence in themselves.

- Do you like to work by yourself?
- Do you do your homework by yourself?
- Do you like to make decisions?

Automobile mechanics do strenuous work.

- Do you enjoy activities such as sports, hiking, dancing, or gardening?
- Do you like to be active most of the time?

Mechanics set their own work pace. A rushed job could cause more trouble later.

Suggested Activities

Read about cars. Your school or public library has books about automobiles and automotive repair. Newsstands often have magazines about cars. The owner's manual for your family car lists its service requirements. If some of these books and magazines are too technical to understand at first, don't become discouraged; many pamphlets are written for people without technical training. For example, you can write to the Consumer Information Center, Pueblo, Colorado 81009 to get the Federal Government's Consumer Information Catalog. Some of the booklets listed there tell how to recognize common car problems, change motor oil, and do a basic engine tune-up.

Use school assignments to learn about cars. You might build a model of a gasoline engine for a science fair. Or write a report about different kinds of engines for an English or a science class.

The conversion to the metric system will affect the work of automobile mechanics. Mechanics will have to use different units of measurement for many items such as engine power (kilowatts rather than horsepower), tire pressure (kilopascals rather than pounds per square inch), and gasoline consumption (liters per 100 kilometers rather than miles per gallon). Automobile mechanics who repair foreign cars already use some metric measurements.

Use the topic of metric measurements in automobile servicing for a report in a mathematics class. You might begin your research by writing for information to the Office of Weights and Measures, National Bureau of Standards, Washington, D.C. 20234. That office also will supply a list, by State, of speakers who are willing to talk to groups about the metric system.

Look for opportunities to repair machines. Work with relatives and friends who repair or service cars, bicycles, or other machines.

If there are automobile or bicycle repair clinics in your community, attend them. These clinics give you a chance to learn basic repairs, such as changing tires.

Join an Automotive Explorer Post if there is one in your area. Exploring is open to young men and women aged 14 through 20. To find out about Explorer posts in your area, call "Boy Scouts of America" listed in your phone book, and ask for the "Exploring Division."

Find out if your school system has courses in auto mechanics. Ask the instructor to come and speak to your class.

Join a chapter of VICA (Vocational Industrial Clubs of America) if your school has one. VICA chapters plan projects, take field trips, and hold competitions in such skill areas as auto mechanics, auto body, and diesel mechanics.

Work with your hands and use tools. Find out what tools you have in your home that mechanics use. Learn to use these tools. Repair and service your bicycle or old machinery such as a typewriter or a clock.

Arrange a class tour of a service department of an automobile dealership. Note that each mechanic may specialize in one type of repair. There may be a brake repairer, a carburetor mechanic, a front-end mechanic, a transmission mechanic, a tune-up mechanic, and a rattle, squeak, and leak mechanic.

Role-play a conversation between a mechanic and a customer. Pretend that you are the mechanic and ask one of your classmates to play the part of the customer. Explain an automotive problem to the customer. Use books about automotive repair as references.

Related Occupations

Would you like to keep engines running and wheels rolling? Repairing automobiles is just one way of doing it.

Unscramble the words listed below to find the names of other mechanics who work with gasoline engines or vehicles.

FARICRAT INAHMCCE

LBCYCIE ERIARRPE

OTAB NEENIG INAHMCCE

USB INAHMCCE

LSDEIE INAHMCCE

AMRF NEUIQPTME INAHMCCE

YECLROOTMC INAHMCCE

SALML ENNIGE INAHMCCE

KTUCR INAHMCCE

See answers at end of chapter.

Computer Service Technician

"I've always been curious about how things work," says Jackie.

"Cunningham, call Mr. Arnold, Commerce National Bank," crackled the radio's speaker.

"Not again," groaned Jackie. She had left Commerce National only a half hour before. After she turned the car around, Jackie looked at her watch. Almost noon. Jackie wondered whether there would be time for lunch today. She already had worked through lunch twice this week.

At one of the busy intersections traffic slowed to a crawl.

"Why are there so many cars on the road on the busy days?" she thought. Jackie drummed her fingers on the steering wheel and looked about. She caught sight of the pile of papers, tools, and trash from fast food restaurants on the back seat of the car. "What a mess," she thought. "Almost time for the semiannual cleaning. I hate to use this car for anything but work, it's so sloppy."

A car horn blared. Another horn sounded impatiently behind her and Jackie stepped on the accelerator. Soon she was pulling into a parking lot near the Benton Building, where Commerce National had its offices.

Jackie grabbed her jacket and picked up the briefcase that held her tools, reports, and repair manuals. She didn't have to take much with her because supplies were stored right at the bank. Data Products, the company Jackie worked for, saw to that. The company also sent spare parts and repair instructions directly to the bank's computer center. That way Jackie and the other service technicians didn't have to carry a lot of supplies around or transport spare parts from Data Products' regional office.

In fact, Jackie sometimes worked for several weeks without going to the regional office at all. As she saw it, her job was taking care of the computer equipment at her three "accounts"—the Commerce National Bank, the County Hospital, and the Wilson Manufacturing Company. So naturally she spent most of her time in those places, not at the Data Products office.

As she rushed through the parking lot, Jackie put on her jacket. "It couldn't be much hotter," she thought as she hurried into the air-conditioned building. Data Products expected the service technicians to dress up for work and fortunately Jackie liked to. But a suit, even this cotton one, certainly could be uncomfortable during the summer.

Jackie pulled out her Data Products' identification card as she passed the bank's security guard and headed for the computer center. When she entered the center, Jackie quickly spotted Mr. Arnold, who ran the office.

"Is it the sorter again, Tom?" she called from across the room.

"Right," replied Mr. Arnold.

"I wish you could have arranged to have it break down when I was here a little while ago instead of making me drive back."

"That would be too easy," joked Mr. Arnold.

Jackie went to the side room where the sorter was located. The room also was used to store supplies and it was cramped. However, Jackie did not have to move the machine as she did in some offices.

The sorter was used to group bank documents in several ways. Checking accounts, for example, could be grouped by the amount of money in them. Twice during the past 5 days the sorter had failed to separate the papers correctly. From Mr. Arnold's description of what had happened, Jackie got an idea of what the problem might be. By listening to the machine she decided that the rubber belts and metal rollers that moved papers through the sorter needed adjustment. Although she already had fixed several of the belts, Jackie was sure that they were the cause of the trouble. She knew that it was not unusual for complex equipment to require several adjustments. She was used to visiting an office several times to fix a machine.

Jackie raised the metal cover on the front of the sorter and turned on the machine. She listened to the hum from the rollers and belts. In a few seconds she located a belt that seemed to need adjustment.

From a cabinet in the room Jackie took a can of oil and a rag. After pouring some lubricant on the rag, she held it against the moving belt for a few minutes. She turned off the machine and tightened a screw at the end of the roller that the belt wound around. This made the belt tighter. Jackie then let the sorter run while she watched and listened to the belt.

"I've got you this time," she murmured to the machine. She had begun to think the sorter had a grudge against her. From the very first time she had worked with electrical equipment—as a hobby when she was a junior high school student—Jackie had noticed that some machines seemed to have personalities. She'd had a lot of experience with data processing equipment since then, and it only confirmed her impression that machines could be as different as people. Yes, quite a bit of experience, now that she thought about it. She'd taken electronics courses in high school. Then the training classes at basic school when she'd first started working at Data Products. And 2 years on the job.

In a way Jackie preferred mechanical problems to the electronic ones, because they were easier to explain to the customers. She could show them a worn or loose belt. Most electronic problems were caused by burnt-out circuit boards. Jackie could locate a bad board with a voltmeter and she could replace it with a new one. However, a burnt-out board looked exactly like a new one. It was sometimes hard to convince customers who

knew little about computers that those innocent-looking boards caused their expensive computers to go haywire.

Jackie closed the machine cover and put away her tools. From her briefcase she took a repair report form. She filled in the date, the machine model, the account's name, and the code letters for the type of breakdown and repair.

She made out a repair report for every service call. Data Products used the information on the forms to determine what kinds of problems there were with the equipment the company made. Engineers used the information to design machines that broke down less often and could be serviced more easily.

Returning to the main computer room, Jackie wrote the date and a brief description of the work she had done in the record book that was kept with the equipment itself. The information in the book would be used by other computer technicians who might work on the machine. Jackie also used the records to keep track of the maintenance that she had done on the machines.

After putting the record book away, Jackie walked to Mr. Arnold's office.

"I think I've fixed it for good this time. But I'd like to be here the next time you use it, just to make sure that everything's okay. Will you be using it soon?"

"Not until tomorrow," said Mr. Arnold.

"Hmm, I'm scheduled for training the rest of the week—well, my backup can handle any problem."

"Training again! I thought you'd already learned everything you needed to know in Data Products' basic school. And aren't you going to night school now?" said Mr. Arnold.

"At basic school I learned how to keep wise guys like you happy and machines like your sorter working," replied Jackie. "The training this week is for your new 360 printer, and night school is part of my plan for the future. I want to be an engineer one day. Then I'll be designing these computers instead of fixing them.

"Well, I'd better run," Jackie continued as she picked up her briefcase. "We've been really busy the last 2 days and I'm supposed to do some maintenance at Wilson Manufacturing this afternoon. If I don't get it done Ken Marcus will have problems and he can be awfully disagreeable when his machines act up."

"Well, not everyone can be a nice guy like me," teased Mr. Arnold.

"True," replied Jackie. "See you next week."

"Take care," called Mr. Arnold, as Jackie rushed out the door.

Jackie called the office dispatcher from the security guard's desk to say that she had answered the Commerce National call. To her surprise there were no other repair calls. Jackie looked at her watch. There was plenty of time to get to the Wilson account. Suddenly she felt relaxed. "I guess I get to have lunch after all," she thought as she headed for her car.

"It's amazing how some computers seem to be personalities," remarks Jackie. "Machines can be as different as people."

Exploring

Computer service technicians repair and service keypunch machines, computer terminals, and other computer equipment.

- Do you enjoy fixing things?
- Do you like to work with your hands?
- Are you interested in electronics and computers?
- Have you ever wondered how computers work? Have you ever tried to find out how other kinds of electronic equipment work—television sets, stereos, tape recorders, or calculators?
- Do you read the owner's manual for calculators, television sets, stereos, or radios? Are you interested in finding out about the machines' specifications?
- Have you ever tried to fix a radio or a pocket calculator?

Computer service technicians must find and correct the cause of computer breakdowns quickly. They work under pressure all the time.

- Do you like to solve problems? Do you like to do written mathematics problems?
- Do you like to do word puzzles or brain teasers?
- Can you usually understand instructions the first time?
- Can you do manual work quickly without making mistakes?
- How well do you work under pressure? Do you have trouble taking tests?

Computer service technicians must get along easily with their customers.

- Do you usually get along with people?
- Are you outgoing?
- Do you enjoy doing things with people?
- How good are you at calming someone down when he or she is angry with you?
- Can you talk your way out of trouble?
- How well can you explain things? Can you give directions?

Computer service technicians spend a lot of time in their clients' offices. They must dress neatly and act professionally.

- Do you like to dress well?
- Do you try to make a good appearance?

Suggested Activities

Use class assignments to learn more about computers. You might do a project on electronics or computers for a science fair. Or prepare a report on electricity, electronics, or computers for a science or English class. Your library has books that can help you.

Arrange to have a computer service technician speak to your class.

Look for an electronic hobby kit in a hobby shop or department store. Visit a computer store if there is one in your area. Build a small computer from a kit.

Build a crystal radio set. You can get help from books in your school or public library.

Join a Computer or an Electronics Explorer Post if there is one in your area. Exploring is open to young men and women aged 14 through 20. To find out about Explorer posts in your area, call "Boy Scouts of America" listed in your phone book, and ask for the "Exploring Division."

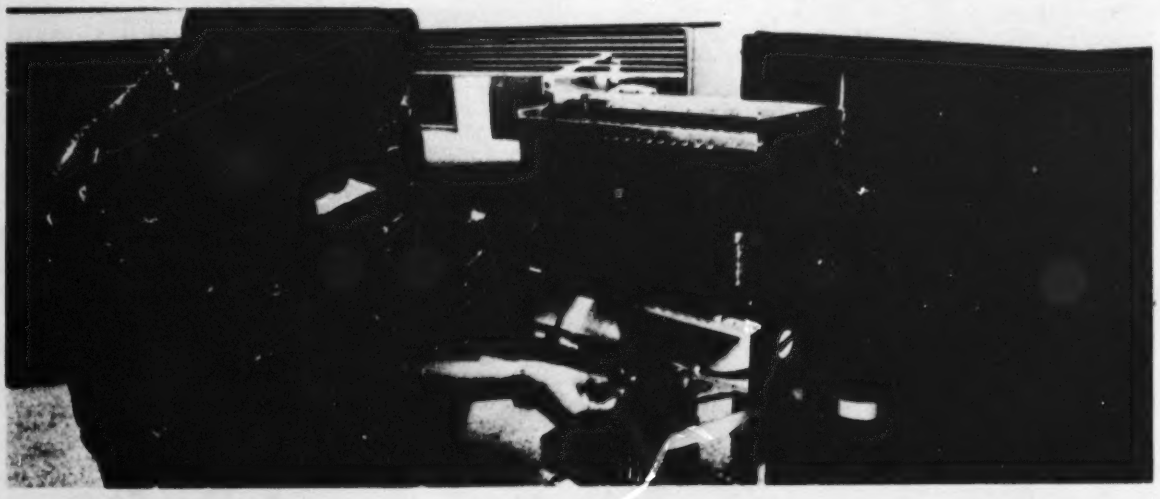
If you are a Girl Scout, see if your troop has the From Dreams to Reality program of career exploration. Scouts learn about electronics and machine repair through site visits, speakers, and actual experience.

If you are a Boy Scout try for Computer, Electricity, Electronics, Machinery, or Radio merit badges.

Join a chapter of VICA (Vocational Industrial Clubs of America) if your school has one. VICA chapters plan projects, take field trips, and hold competitions in such skill areas as industrial electronics, electrical trades, and radio and TV repair.

Dealing with people is an important part of a technician's work. Try tutoring other students in mathematics or science to gain experience explaining problems.

Mechanics and Repairers



Jackie's ambition is to be an engineer. "Then I'll be designing computers instead of fixing them."

Related Occupations

Computer service technicians aren't the only mechanics who fix electronic machinery. Decode the words below to find others. Each number stands for a letter. Use this clue to get started.

1 = A
5 = E
9 = I
15 = O
21 = U
25 = Y

a. 1-16-16-12-9-1-14-3-5
18-5-16-1-9-18-5-18

b. 1-21-20-15-13-15-20-9-22-5
5-12-5-3-20-18-9-3-9-1-14

c. 2-21-19-9-14-5-19-19 13-1-3-8-9-14-5
13-5-3-8-1-14-9-3

d. 5-12-5-3-20-18-15-14-9-3 15-18-7-1-14
20-5-3-8-14-9-3-9-1-14

e. 9-14-19-20-18-21-13-5-14-20
18-5-16-1-9-18-5-18

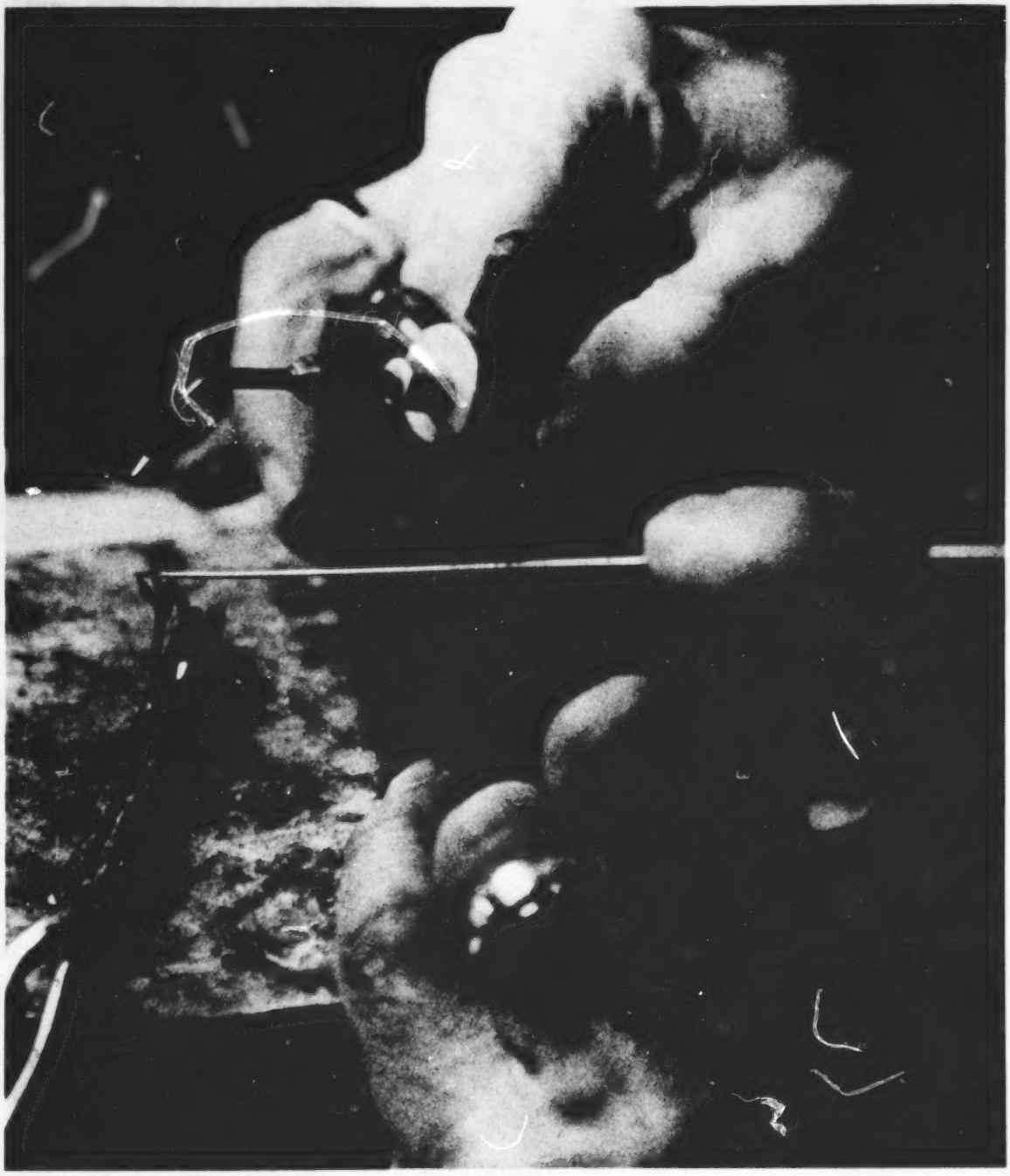
f. 18-1-4-9-15 18-5-16-1-9-18-5-18

g. 18-1-4-1-18 13-5-3-8-1-14-9-3

h. 20-22 19-5-18-22-9-3-5
20-5-3-8-14-9-3-9-1-14

See answers at end of chapter.

Jeweler



Mr. Anthony is a perfectionist. "I would rather lose money than do a job that I'm not satisfied with."

The jewelry store was dark except for a single bright light in the back, where Mr. Anthony sat at his repair bench. Scattered on top of the bench were some tweezers and pliers, small brown envelopes, eyeglasses, wooden blocks, and gold wire.

Mr. Anthony straightened his back and stretched his arms over his head to loosen up before starting the next job. His eyes were tired from working under the bright light. He placed the bracelet that he had just finished in a small case lined with velvet.

Glancing at his watch he thought, "Less than an hour till the store opens. I'd better not start making Mrs. Blue's earrings. Once the customers begin coming in it'll be too hard to concentrate."

As Mr. Anthony placed the gold wire in one of the drawers, he looked at the brown envelopes on the top of the bench. One was marked, "Repair ring setting". Mr. Anthony picked up the envelope and removed the ring. Then he slipped on his magnifying glasses and examined it.

The ring was made of gold and had an emerald in the center. Two small loops of gold held the stone in place, but one of the loops had broken at the bottom. To fix the ring, Mr. Anthony would have to remove the stone and then solder the loop to the top of the ring. The work would be delicate (a slip of the pliers and the valuable stone could be chipped and ruined). However, Mr. Anthony had fixed many rings in the years he had worked as a jeweler. He knew that interruptions wouldn't bother him.

Using a pair of pliers, Mr. Anthony bent back both the loops of wire. He worked the stone loose from the small gold plate on which it was mounted.

The opening of the store's front door startled him. "Mr. Anthony, is that you?" It was Ms. Rothstein, the salesclerk.

"Yes, it's me, Deb."

"Have you been here long?"

"Only a few hours."

"Honestly, this is the third time this week that you've come in early. If you don't slow down, your ulcer will act up again."

"Well, with the holidays coming up, there's a lot of work to do and with so many customers coming in I can't work undisturbed during the day."

"I know, but you really should take it easy or..."

"Okay, okay! Let's get some work done," snapped Mr. Anthony. "Set the jewelry in the display cases and get ready to open the store."

Ms. Rothstein quickly returned to the front of the store. Her feelings were hurt, and it showed. He appreciated her concern, but he was tired and irritable. In a few moments Mr. Anthony was sorry that he had been rude. He made up his mind to smooth things over as soon as he could. After all, Deb was a first class salesperson... and a good friend. Funny how people you work with every day can become like members of your family, he thought. He put on his magnifying glasses and returned to work.

Before he could solder the wire, it had to be filed so it would lie flat on the top of the ring. With a few swift movements the filing was done. Using the pliers, Mr. Anthony bent the wire down so it touched the top of the ring. He examined the ring to be sure it was ready and stepped to the table where he kept his soldering equipment.

Holding the ring with tweezers, he dipped it in an acid solution that would keep the metal from turning black under the torch's flame. Placing the ring in a soldering clamp, he took a pack of gold solder from a drawer in the table.

"Excuse me," called Ms. Rothstein from the sales floor. "Did the gift boxes come in yesterday?"

"No, and I hope we get them today. We're almost out. If there's one thing we don't need now it's customers complaining about boxes. If they don't come in by noon, let's call Schmit's," he added.

Mr. Anthony took a piece of solder from a drawer in his bench. From this piece he clipped a speck of solder smaller than a grain of sand. Taking the torch from its stand, he lit it and adjusted the flame to a fine line. With the tip of an old file, he held the speck of solder to the break in the ring, then carefully but quickly applied the torch. In seconds the solder had melted in place. Mr. Anthony made sure he turned off the torch and replaced it in the stand. Once he had burned his hand because he had not turned off the flame completely. Mr. Anthony removed the ring from its stand and looked closely at the soldered joint. Everything was all right.

Mr. Anthony went into the back room where he kept his polishing machine. He took a wheel with bristles from a set on the table. After slipping the wheel onto the machine and turning it on, he touched the edge of the spinning bristles with a lump of abrasive clay called "tripoli." The tripoli quickly covered the end of the bristles. Holding the ring in his fingers he ran the soldered joint under the bristles. When he pulled the ring back from the wheel, the lump of solder was smooth with the joint. Mr. Anthony stopped the polishing machine and slipped on a different wheel. To the bristles on this wheel he applied jeweler's rouge (a red clay made of iron oxide). This time he polished the entire ring. Mr. Anthony then placed the ring in an ultrasonic cleaner. The cleaner used air bubbles to remove tiny particles of dirt. After a few minutes he removed the ring from the machine and examined it under a lamp. The gold spar-

kled under the light and there was hardly a trace of the soldered joint. But a jeweler could see that the solder was a different color than the gold.

"One more step," thought Mr. Anthony. Although many jewelers might reset the stone at this point, Mr. Anthony was a perfectionist. He would rather lose money than do a job that didn't satisfy him. To "do it right" he would goldplate the ring to hide the soldered joint. Mr. Anthony quickly set up the equipment to goldplate the ring. The process would take several minutes, so he leaned against the wall and relaxed.

"Do it right" had been Mr. Konczynski's motto, thought Mr. Anthony, suddenly remembering the days when he was first learning his trade. He had gone to Mr. Konczynski's jewelry repair shop as an apprentice when he was just 16 and stayed there 4 years. The apprenticeship had been hard. The pay was low and Mr. Konczynski was a demanding boss. Nothing less than perfect work would suit him. However, Mr. Anthony never regretted the years he had spent learning his trade. He had learned all types of jewelry work—stone setting, watch repair, jewelry making and repair, and model-making. These days, only a few shop or store owners hire apprentices. Most jewelers learn their trade in jewelry factories. But factory work is so specialized that a person usually can learn only one or two skills.

The buzz of the timer interrupted Mr. Anthony's thoughts. The goldplating was done. The ring had been covered by a new layer of gold. No one would be able to see it was soldered.

All that remained of this job was to reset the stone, but this was no simple task. The stone had to be set exactly right. If it tilted even a little, the ring would look lopsided. Further, when he was setting the prongs over the stone, a slip of his hand could easily chip or scratch the emerald.

As Mr. Anthony returned to his bench, Ms. Rothstein called from the sales floor.

"Mr. Anthony, could you step out here for a moment? This gentleman has a problem." She was standing behind a display case, across from a customer. Mr. Anthony straightened his tie, glanced in the mirror by his bench to see that his hair was neat, and went to the counter.

"How can I help you?" he asked the man on the other side of the counter.

"You can help me by giving me my wife's necklace," snapped the man.

"Mr. Johnson brought a necklace in to have the clasp fixed yesterday," explained Ms. Rothstein. "You weren't here at the time, so I put it on your table."

"If you could wait a few minutes, I can fix the necklace right now," he said.

"Well, I don't have a few minutes to waste," complained Mr. Johnson. "I have things to do and my wife wants to wear that necklace to a party tonight."

"It won't take long at all," said Mr. Anthony, reassuringly.

"I should hope not. After all the business I've given this store, I think I have a right to expect decent service."

Mr. Anthony did not wait for him to continue. He stepped back to his bench, took the necklace out of a brown envelope, and quickly replaced the clasp.

When he stepped back to the counter, Mr. Johnson said, "Well, it's about time." He was taking out his billfold when Mr. Anthony said, "No charge, to make up for the inconvenience."

"Oh! Well . . . thank you," said Mr. Johnson as he left the store.

"He is a good customer but he's hard to handle when he's rushed," said Ms. Rothstein.

"I know," sighed Mr. Anthony. "But I guess everyone gets a little touchy before the holidays. I'm sorry I snapped at you before."

"That's okay."

The door opened and Ms. Wang entered.

"Good morning, Ms. Wang. You've come for the ring?" said Mr. Anthony.

A slip of the hand could chip or scratch a valuable gem.

"Yes, I'm anxious to see it."

"It's in the safe in the back room. I'll get it."

Mr. Anthony returned to the sales floor holding a black ring box. He held the box under a fluorescent lamp on the counter and opened it. The ring in the box sparkled as the lamp light was reflected from the three diamonds which surrounded a ruby on the top of the ring.

Ms. Wang stared at the ring and murmured, "Beautiful, truly beautiful."

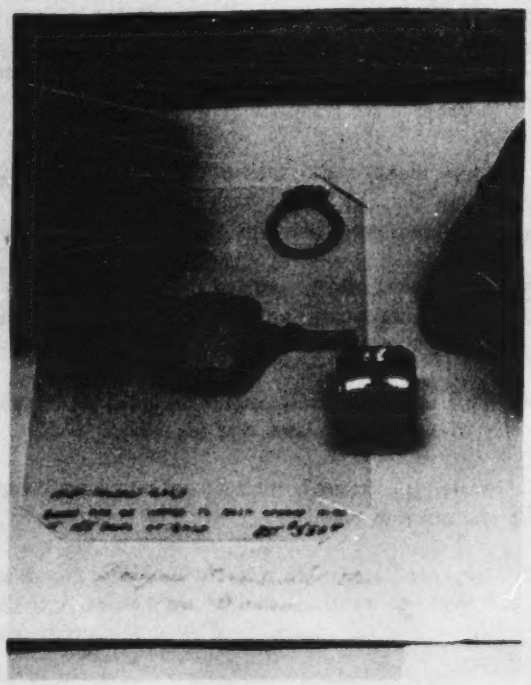
"I'm glad you like it," said Mr. Anthony.

Mr. Anthony had made the ring by hand following a design Ms. Wang had given him. He had used pliers to shape the ring from gold wire. He had made the settings for the stone from platinum in a similar fashion. It had been a long and difficult job but worth the effort. To Mr. Anthony the ring was a work of art in metal and stones.

"Ms. Rothstein will wrap the ring and make out your receipt," said Mr. Anthony.

"Fine," replied Ms. Wang. "Thank you again. You've done a magnificent job."

Mr. Anthony smiled broadly, then hurried back to his bench.



Mr. Anthony designs jewelry to suit the customer.

Exploring

Jewelers make and repair jewelry. They work with precious stones and metals.

- Does jewelry interest you?
- Do you like to look at jewelry displays in stores or in museums?
- Do you like to look at exhibits of precious stones and metals?
- Have you ever wondered how jewelry is made?
- Have you ever watched a jeweler or watch repairer at work in a store?
- Did you ever try to make or design a piece of jewelry or some other ornament?

Working from drawings or sketches, jewelers shape metal into pins, earrings, rings, and other jewelry. Their work must be attractive.

- Do you like to make or build things?
- Do you like to work with tools?
- Can you look at a drawing and picture a three-dimensional object?
- Are you interested in art?
- Can you explain why a piece of jewelry appeals to you?
- Do you select jewelry to match your clothing?

Jewelers must be able to do very delicate work with their hands. They often work with small, valuable objects, such as gold ring settings and diamonds.

- Do you enjoy doing detailed work such as embroidering or building models from kits?
- Do you have nimble fingers? Can you thread a needle quickly?

Jewelers work without supervision. They must be responsible and take pride in their work.

- Do you usually complete your homework assignments on time?
- Are you one of the "workers" when you are on a school committee?
- Do you work on a project for one of your classes in school until it's just right?
- Do you stick with an activity such as building a model until it's done as well as you can do it?

Suggested Activities

Use jewelry and jewelry making as topics for school assignments. Write about jewelry styles during different periods of history for an English or a social studies report. Design or make jewelry for an art class. Explain or demonstrate how jewelry is electroplated for a science class. For a mathematics class, prepare a report on the systems of measurements used by jewelers—karats and troy weight for gems and carats for precious metals. Your library has books that will help you with these projects.

Visit exhibits of jewelry in museums, shopping malls, and craft fairs. Look for an opportunity to talk with goldsmiths, silversmiths, enamelists, or other craftworkers who make jewelry or works of art from precious metals or stones. Ask about their work. How do they feel about it? How did they become interested in their craft? How did they learn their skills?

Arrange a class tour of a jewelry repair shop or a jewelry store that has a jeweler. If there is a jewelry factory in your area, try to arrange a class tour. You will see that the work in the jewelry factory is much more specialized than in a store or repair shop.

Make some jewelry. Learn what tools jewelers use; learn how they shape metal. You will find jewelry kits in hobby shops and department stores. These can help you learn basic manual skills. Look for kits that use metal or involve very detailed and delicate work. Other activities that will help you develop manual skills are model building and needlework.

If you are a Girl Scout, see if your local troop has the From Dreams to Reality program of career exploration. Troops also may offer opportunities to try out careers through internships, service aide and community action projects, and proficiency badges in a number of areas including Ceramics and Pottery and Metal Arts.

If you are a Boy Scout, try for merit badges in Drafting, Leatherwork, Machinery, Metalwork, Model Design and Building, Pottery, or Sculpture.

Join a chapter of VICA (Vocational Industrial Clubs of America) if your school has one. VICA chapters plan projects, take field trips, and hold competitions in such skill areas as jewelry repair and watchmaking.

Write for information about the occupation to Retail Jewelers of America, Time-Life Building, Rockefeller Center, 1271 Avenue of the Americas, New York, New York 10020.

Related Occupations

Jewelers are not the only workers who make and repair metal products. Descriptions of seven such workers are listed below, along with the names of seven occupations. Try to match the workers with their job titles.

a. Automobile Body Repairer
b. Goldsmith
c. Machinist
d. Modelmaker
e. Silversmith
f. Tool Maker
g. Watch Repairer

1. Max uses hammers, torches, and crowbars to make accident cases look like new.

2. Neal makes parts for cars, ships, trains, and other machines. He uses lathes, milling machines, and other power tools and works with many different metals, including steel, iron, aluminum, and brass.

3. Hope makes metal samples that are used to mass-produce jewelry. She shapes metals such as brass just as a jeweler shapes gold, silver, or platinum.

4. Emily works from sketches and diagrams just like a jeweler. She makes the part of a lathe, milling machine, or other machine tool that cuts metal.

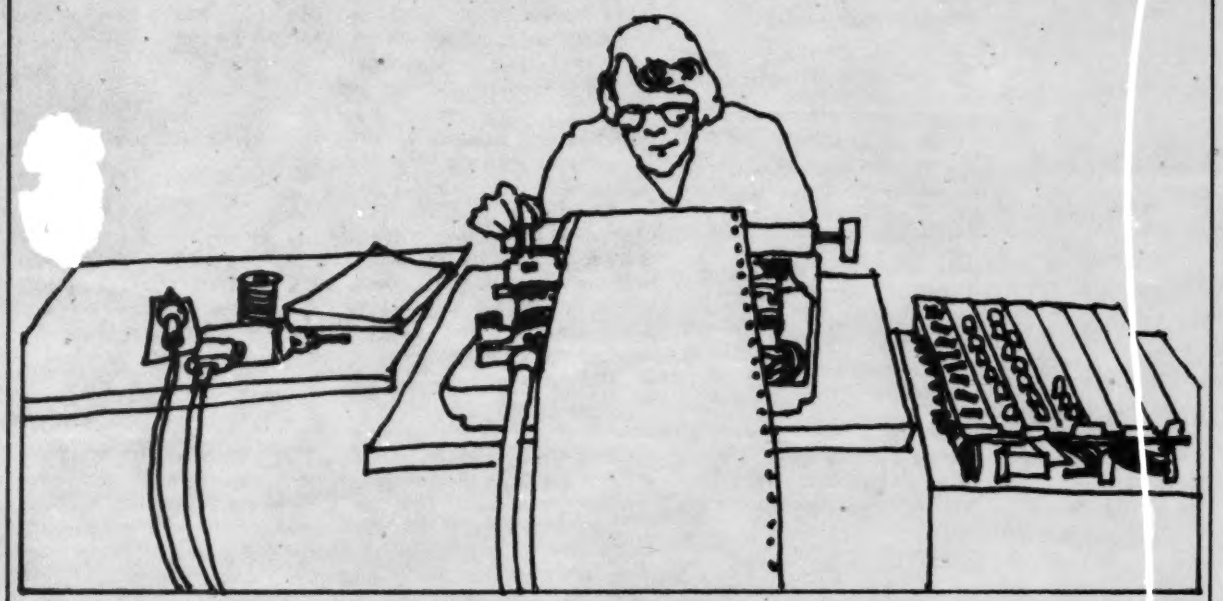
5. Phil uses a precious metal to make and repair jewelry, knives, forks, plates, and tea sets.

6. Karen specializes in making and repairing jewelry from one precious metal.

7. Because Larry often wears magnifying glasses on the job, many people think that he is a jeweler. Actually, he repairs one of the smallest and most commonly used machines.

See answers at end of chapter.

Job Facts



There isn't room in this book for a story about every kind of mechanic and repair occupation. However, you'll find some important facts about 28 of these occupations in the following section. If you want additional information about any of them, you might begin by consulting the *Occupational Outlook Handbook*, a publication of the Department of Labor which should be available in your school or public library.

Occupation	*Nature and Places of Work*	*Training and Qualifications*	*Other Information*
TELEPHONE CRAFT OCCUPATIONS			
Central Office Craft Occupations	Central office craftworkers work for telephone companies throughout the country. Most central offices are in or near large cities.	Central office craftworkers usually begin working for the telephone company in other jobs. To become craftworkers they take classes at company schools and receive on-the-job training from experienced workers. Some craftworkers learn their skills in vocational schools or apprenticeships.	Central office craftworkers may have to work evenings, weekends, and holidays. They often work in teams.
Central Office Equipment Installers	Most installers work for companies that make central office equipment. Some work for telephone companies. Most central offices are in or near large cities.	Central office equipment installers are trained by the companies they work for. Usually they receive on-the-job training plus classroom instruction. Classes may be held at the factory where the equipment is made.	Some installers do a lot of travelling. They may be assigned to areas that include several States. Installers often work in teams.

Occupation	*Nature and Places of Work*	*Training and Qualifications*	*Other Information*
Line Installers and Cable Splicers	Line installers and cable splicers work for telephone companies throughout the country.	Telephone companies usually provide both on-the-job training and classroom instruction. Some line installers and cable splicers learn their skills in vocational schools or apprenticeships.	Some line and cable work is strenuous. Workers have to climb poles and lift heavy cables and equipment.
Telephone and PBX Installers and Repairers	Telephone and PBX installers and repairers work for telephone companies throughout the country.	Installers and repairers usually begin working for the telephone company in other jobs. To become installers and repairers, they take classes at company schools and receive on-the-job training from experienced workers. Some installers and repairers learn their skills in vocational schools or apprenticeships.	PBX stands for Private Branch Exchange. Telephone and PBX installers and repairers do much of their work in customers' homes and offices. They travel in trucks equipped with tools and supplies. Sometimes they work outdoors.
OTHER OCCUPATIONS			
Air-Conditioning, Refrigeration, and Heating Mechanics	Most air-conditioning, refrigeration, and heating mechanics work for companies that sell and install cooling and heating equipment.	Most of these mechanics start as helpers and learn their skills by working with experienced mechanics for several years. Some learn through apprenticeships. Employers prefer to hire people with a high school education.	Air-conditioning, refrigeration, and heating mechanics often work long, irregular hours during peak seasons in the summer and winter.
Airplane Mechanics	Over one-half of all airplane mechanics work for the airlines. About one-third are employed by the Federal Government. The rest work for small repair shops or companies with their own planes.	Most airplane mechanics learn their trade in the Armed Forces or in trade schools certified by the Federal Aviation Administration (FAA). A high school diploma is preferred by employers. The majority of mechanics have FAA licenses. Applicants for licenses must have work experience and pass written and oral tests.	Aircraft mechanics often work in high places, such as on top of wings and fuselages of large jet planes.
Appliance Repairers	Most appliance repairers work for appliance stores and repair shops. Others work for appliance manufacturers, department stores, wholesalers, and utility companies.	Most appliance repairers start as helpers and learn their trade on the job. A high school education is preferred by employers.	Appliance repairers usually work with little or no direct supervision. Some spend several hours a day driving to job sites.
Automobile Body Repairers	Most automobile body repairers work for repair shops or for automobile and truck dealers. Some work for trucking companies, buslines, and motor vehicle manufacturers.	Most automobile body repairers start as helpers and learn their trade by working with experienced repairers for several years. Some learn through apprenticeships.	Automobile body repairers usually work with little or no direct supervision. The work often is dirty and strenuous. Repairers usually buy their own handtools.

Mechanics and Repairers

Occupation	*Nature and Places of Work*	*Training and Qualifications*	*Other Information*
Automobile Mechanics	Most automobile mechanics work for automobile dealers, automobile repair shops, or gasoline service stations. Some mechanics work for government agencies and businesses that have their own automobile repair departments. Still others work for automobile manufacturers.	Automobile mechanics usually learn their skills on the job. Some mechanics learn through apprenticeships that combine classroom instruction and on-the-job training. Courses in automobile repair are helpful in getting a job. Mechanics must have a driver's license.	After they have worked for a while and mastered their skills, some automobile mechanics open their own repair shops or gasoline service stations. Mechanics often work over 40 hours a week. They usually buy their own handtools.
Boat-Engine Mechanics	Most boat-engine mechanics work for boat dealers or marinas. Some work for companies that manufacture boats.	Boat-engine mechanics usually learn on the job. They start as helpers and work under the supervision of experienced mechanics. Employers prefer to hire high school graduates.	Boat-engine mechanics often work overtime during the spring and summer. Mechanics may repair minibikes, motorcycles, snowmobiles, and lawnmowers.
Bowling-Pin-Machine Mechanics	Almost all bowling-pin-machine mechanics work in bowling centers. A few work for companies that manufacture automatic pinsetters.	Bowling-pin-machine mechanics learn on the job under the supervision of experienced workers.	In some bowling centers, mechanics do all the maintenance work such as polishing lanes and reconditioning pins.
Business Machine Repairers	Most business machine repairers work for companies that make such business machines as typewriters, postage meters, and photocopiers. Some repairers work directly for companies that use the machines.	Business machine repairers usually attend schools run by their employers. They learn on the job under the supervision of experienced workers. Employers require a high school diploma and prefer people who have had some technical training in machine repair.	Business machine repairers must keep customers satisfied. They have to be pleasant and cooperative and dress neatly. Training in electronics is becoming more important.
Computer Service Technicians	Most computer service technicians work for companies that repair computer equipment or for companies that make the equipment. Some technicians work for organizations that have large computer centers.	Computer service technicians usually attend company schools for several months and study computer theory, math, electronics, and other subjects. They also learn on the job under the supervision of experienced workers. Employers look for people with some post-high school technical training.	Computer service technicians cannot count on a 9-to-5 workday. They often are on call 24 hours a day or work shifts. They must dress neatly, be pleasant, and know how to deal with people.
Diesel Mechanics	Most diesel mechanics work for distributors and dealers of diesel equipment. Some work for trucking firms, buslines, independent repair shops, or diesel engine manufacturers.	Diesel mechanics usually train on the job under the supervision of experienced workers. Some mechanics learn their skills through apprenticeships or in vocational schools. Most employers prefer high school graduates.	Most jobs in the field are filled by mechanics who have experience repairing gasoline engines.

Occupation	*Nature and Places of Work*	*Training and Qualifications*	*Other Information*
Electric Sign Repairers	Most electric sign repairers work in small shops that manufacture, install, and service electric signs.	Electric sign repairers usually start as helpers and learn their skills by working with experienced repairers. Some train through apprenticeships. A high school diploma is preferred by most employers and required for apprenticeships.	Electric sign repairers cannot be afraid of heights. They often work on ladders or in the baskets of boom trucks.
Farm Equipment Mechanics	Most farm equipment mechanics work in the service department of farm equipment dealers. Some work in independent repair shops or for large farms. They usually work in small towns or rural areas.	Farm equipment mechanics usually start as helpers and learn their trade by working with experienced repairers. Some train through apprenticeships or vocational schools. Most employers prefer high school graduates.	Farm equipment mechanics work long hours during planting and harvesting season—as much as 10 to 12 hours a day, 7 days a week. They often travel to the fields to repair broken equipment.
Industrial Machinery Repairers	Industrial machinery repairers work in manufacturing plants. They maintain and repair the machines used to make food products, chemicals, paper, and thousands of other products.	Most industrial machinery mechanics start as helpers and learn their trade by working with experienced repairers. Some train through apprenticeships. Most employers prefer high school graduates.	Industrial machinery mechanics may work nights and weekends. They have to be agile and in good physical condition in order to work with large machines.
Instrument Repairers	Most instrument repairers work for industrial firms or power companies. They maintain and repair the instruments used in producing chemicals or petroleum, for example. Some repairers work for companies that manufacture instruments. Some work for repair companies or for the Federal Government.	There are several ways of training for a job in this occupation. Instrument repairers often start work as production workers, then train on the job. Some train through apprenticeships. Technical schools, community or junior colleges, and the military also teach the skills needed to become an instrument repairer. A high school diploma is required.	Technical training following high school is increasingly important. Instrument repairers may work nights and weekends.
Jewelers	Most jewelers work in precious jewelry factories or jewelry repair shops. Some work in stores that sell jewelry. Most precious jewelry factories are in New York City.	Jewelers usually learn their skills by working under the supervision of experienced jewelers. Some train through apprenticeships or in vocational schools. Most employers prefer a high school education.	Once they have mastered the trade, many jewelers open their own jewelry repair shops.
Locksmiths	Most locksmiths work for locksmith shops or operate their own shops. Some work in hardware and department stores or in large industrial plants.	Beginners usually learn their trade by working with experienced locksmiths. Some train in vocational schools. A high school education is preferred by most employers. Many States and cities have licensing requirements.	Locksmiths may be on call and work nights and weekends. They spend several hours a day driving to job sites.

Mechanics and Repairers

Occupation	*Nature and Places of Work*	*Training and Qualifications*	*Other Information*
Maintenance Electricians	More than half of all maintenance electricians work for manufacturing industries. Some are employed by public utilities, mines, railroads, and Federal, State, and local governments.	Most maintenance electricians learn their trade on the job as helpers or through apprenticeship. Some learn the trade in the Armed Forces. A high school diploma is required for an apprenticeship. Many local governments have licensing requirements.	Following safety principles is very important, because maintenance electricians work near high-voltage industrial equipment.
Motorcycle Mechanics	Most mechanics work for motorcycle dealers. Some are employed by city governments to repair police motorcycles.	Motorcycle mechanics usually start as helpers and learn their skills by working with experienced mechanics. Most employers prefer high school graduates. Mechanics must have a motorcycle driver's license.	Motorcycle mechanics often work overtime during the summer. Mechanics must buy their own handtools.
Piano and Organ Tuners and Repairers	Most work for repair shops or operate their own shops. Some repairers are employed by piano and organ dealers and manufacturers.	Piano and organ tuners and repairers usually start as helpers and learn their skills by working with experienced repairers. A small number of technical schools and colleges have courses in piano repair. Most employers prefer high school graduates.	Piano and organ tuners and repairers often work evenings and weekends. They are busiest during the fall and winter because people spend more time inside.
Shoe Repairers	Most shoe repairers work in repair shops. About half own their own shops. Some repairers are employed in shoe stores, department stores, and drycleaning shops.	Shoe repairers usually start as helpers and learn the trade by working with experienced repairers. Some train at vocational schools.	Self-employed shoe repairers work long hours—sometimes as much as 10 hours a day, 6 days a week.
Radio and Television Service Technicians	Most radio and television service technicians work in shops and stores that sell or service radios, television sets, and other electronic products.	Up to 2 years of technical training in electronics and 2 to 4 years of on-the-job experience usually are required to become a service technician. Technical training is available from high schools, vocational schools, and the Armed Forces. Many States require service technicians to have licenses.	Many radio and television service technicians open their own repair shops.
Truck Mechanics and Bus Mechanics	Most truck mechanics work for companies that own fleets of trucks. Others are employed by truck dealers, truck manufacturers, or Federal, State, and local governments. Most bus mechanics work for local transit companies or intercity buslines.	Most truck and bus mechanics start as helpers and learn the trade by working with experienced mechanics. Some mechanics train through apprenticeships. A high school education is preferred by most employers. Truck and bus mechanics may need a State chauffeur's license.	Truck and bus mechanics may work evenings, nights, and weekends. They occasionally make emergency repairs on the road.

Occupation	*Nature and Places of Work*	*Training and Qualifications*	*Other Information*
Vending Machine Mechanics	Most vending machine mechanics work for companies that install and service vending machines. Some work for companies that own beverage machines, juke boxes, pinball machines, and laundry and drycleaning machines.	Vending machine mechanics usually start as helpers or route drivers. They learn their trade by working with experienced mechanics. A high school education is desirable. A driver's license is required.	Vending machine mechanics frequently work at night and on weekends and holidays.
Watch Repairers	Most watch repairers work in jewelry stores or repair shops. A small number work in watch factories.	Most watch repairers learn their skills in watch repair schools. Courses last from 1 to 3 years. Some watch repairers train through apprenticeship or on the job. A high school education is preferred by most employers and schools. Ten States require watch repairers to have a license.	Many watch repairers open their own shops.

Answers to Related Occupations

AUTO MECHANIC

1. Aircraft mechanic, 2. Bicycle repairer, 3. Boat engine mechanic, 4. Bus mechanic, 5. Diesel mechanic, 6. Farm equipment mechanic, 7. Motorcycle mechanic, 8. Small engine mechanic, 9. Truck mechanic.

COMPUTER SERVICE TECHNICIAN

1. Appliance repairer, 2. Automotive electrician, 3. Business machine mechanic, 4. Electronic organ technician, 5. Instrument repairer, 6. Radio repairer, 7. Radar repairer, 8. TV service technician.

JEWELER

1. Automobile body repairer, 2. Machinist, 3. Modelmaker, 4. Tool maker, 5. Silversmith, 6. Goldsmith, 7. Watch repairer.

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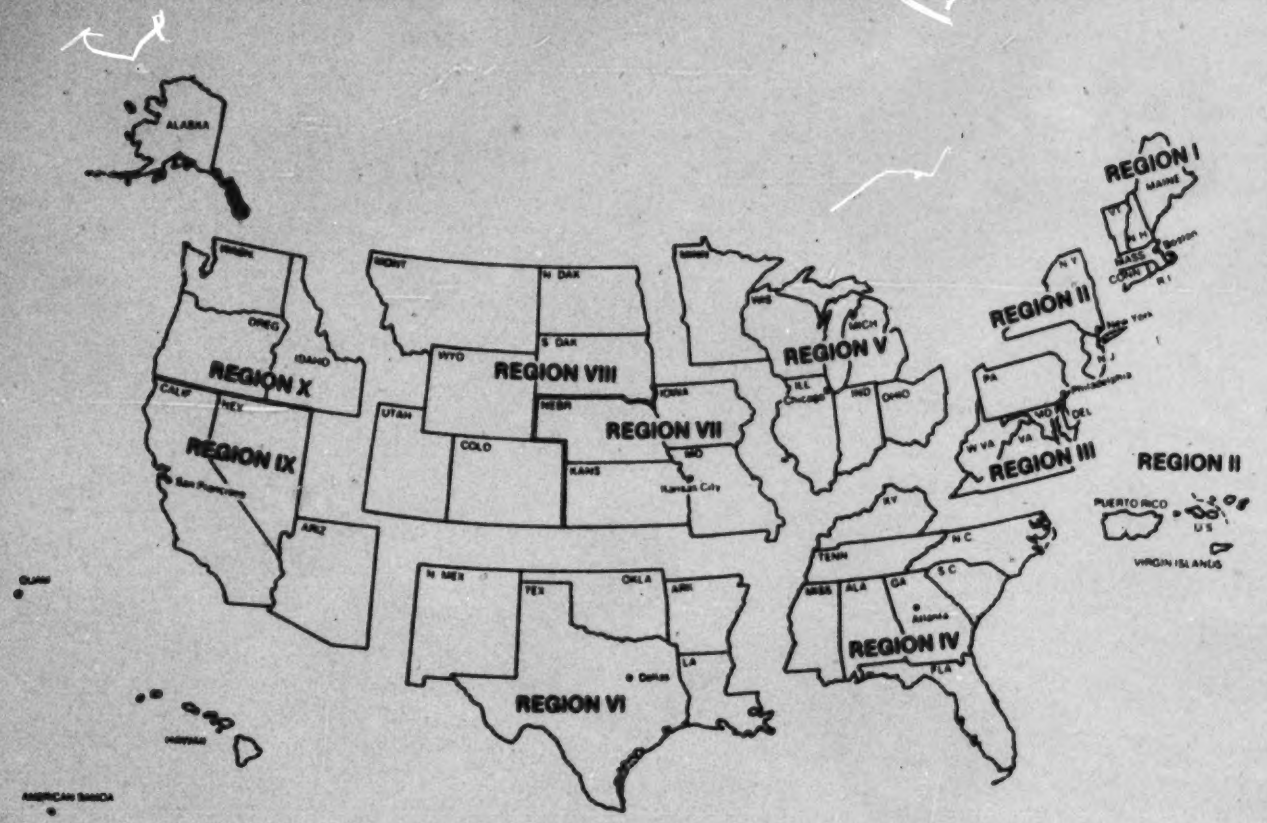

Region I
1603 JFK Federal Building
Government Center
Boston, Mass. 02203
Phone: (617) 223-6761

Region II
Suite 3400
1515 Broadway
New York, N.Y. 10036
Phone: (212) 944-3121

Region III
3535 Market Street
P.O. Box 13309
Philadelphia, Pa. 19101
Phone: (215) 596-1154

Region IV
1371 Peachtree Street, N.E.
Atlanta, Ga. 30309
Phone: (404) 881-4418

Region V
9th Floor
Federal Office Building
230 S. Dearborn Street
Chicago, Ill. 60604
Phone: (312) 353-1880

Region VI
Second Floor
555 Griffin Square Building
Dallas, Tex. 75202
Phone: (214) 767-6971

Regions VII and VIII
911 Walnut Street
Kansas City, Mo. 64106
Phone: (816) 374-2481

Regions IX and X
450 Golden Gate Avenue
Box 36017
San Francisco, Calif. 94102
Phone: (415) 556-4678